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Furst et al.

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(54) **PUMPING DEVICE**

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(21) Appl. No.: **09/931,114**

(22) Filed: **Aug. 16, 2001**

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(30) **Foreign Application Priority Data**

Feb. 19, 1999 (DE) 199 07 222

(51) **Int. Cl.**[7] **F04B 43/00**
(52) **U.S. Cl.** **417/479**; 417/571
(58) **Field of Search** 417/53, 479, 571; 606/172; 30/41; 117/104; 128/66

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,754,228	A	*	7/1956	Bede	117/104
3,645,651	A		2/1972	Bills	
3,910,266	A	*	10/1975	Kawase	128/66
4,228,587	A	*	10/1980	Bennett	30/41
4,480,387	A	*	11/1984	Costemore d'Arc	30/41
5,098,262	A	*	3/1992	Wecker et al.	417/479
5,586,868	A	*	12/1996	Lawless et al.	417/53
5,653,025	A	*	8/1997	Cheng et al.	30/41
5,993,180	A	*	11/1999	Westerhof et al.	417/571
6,126,669	A	*	10/2000	Rijken et al.	606/172

FOREIGN PATENT DOCUMENTS

FR	2 382 319	9/1978
FR	2 613 975	10/1988
WO	WO 98/08661	3/1998

* cited by examiner

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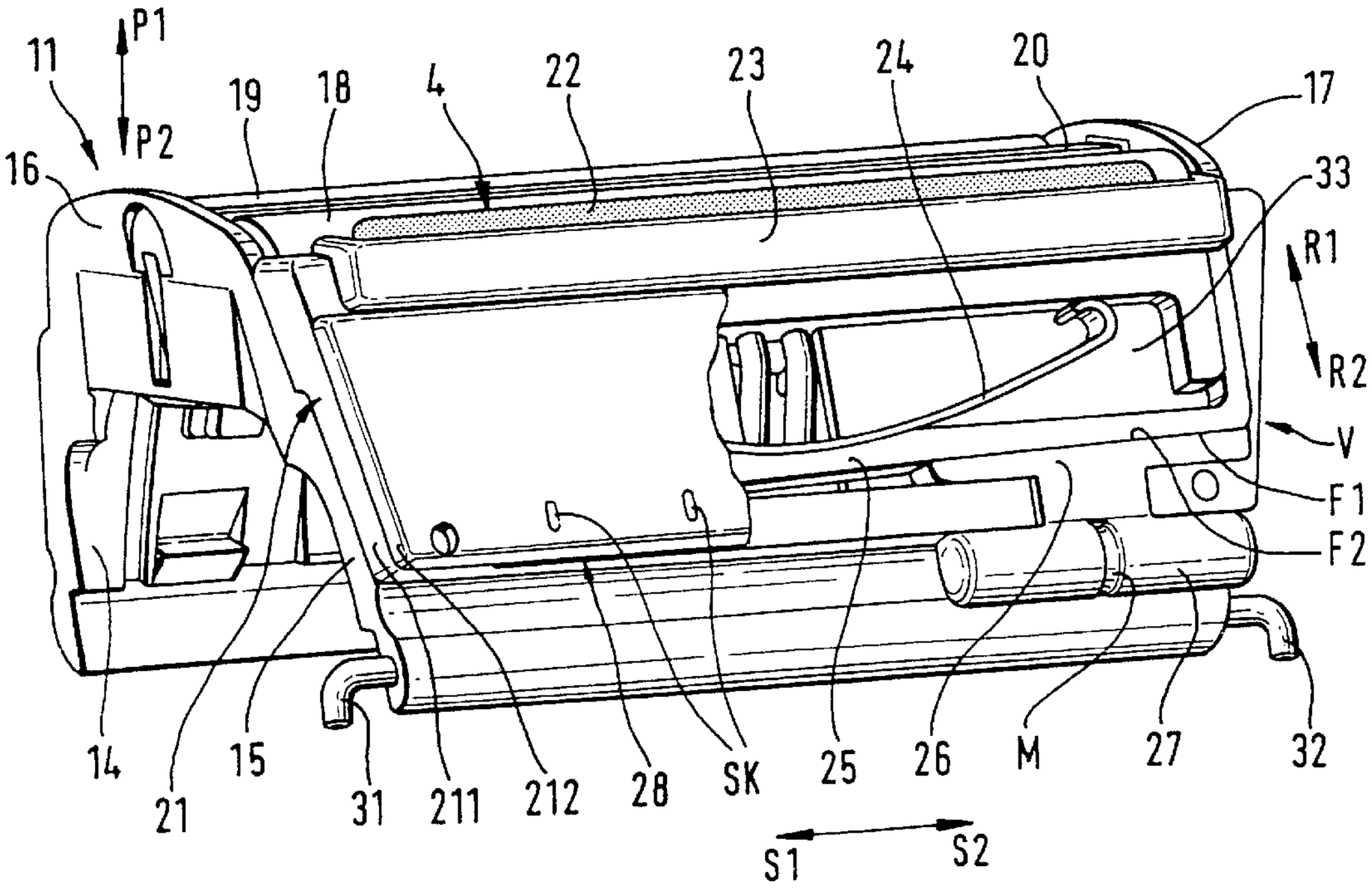
(57) **ABSTRACT**

A pumping device for drawing in and delivering a liquid to a liquid dispensing device of a hair removing apparatus the pumping device includes a pump inlet and a pump outlet and a pumping element. The pumping device is formed by a first and a second housing part each having integrally formed therein a first and a second flow channel. The pumping device includes a membrane member disposed between the first and the second housing part the membrane member includes a pumping element and at least one valve element. The pump inlet is adapted to be coupled to a liquid dispensing device and the pump outlet to a liquid container.

21 Claims, 7 Drawing Sheets



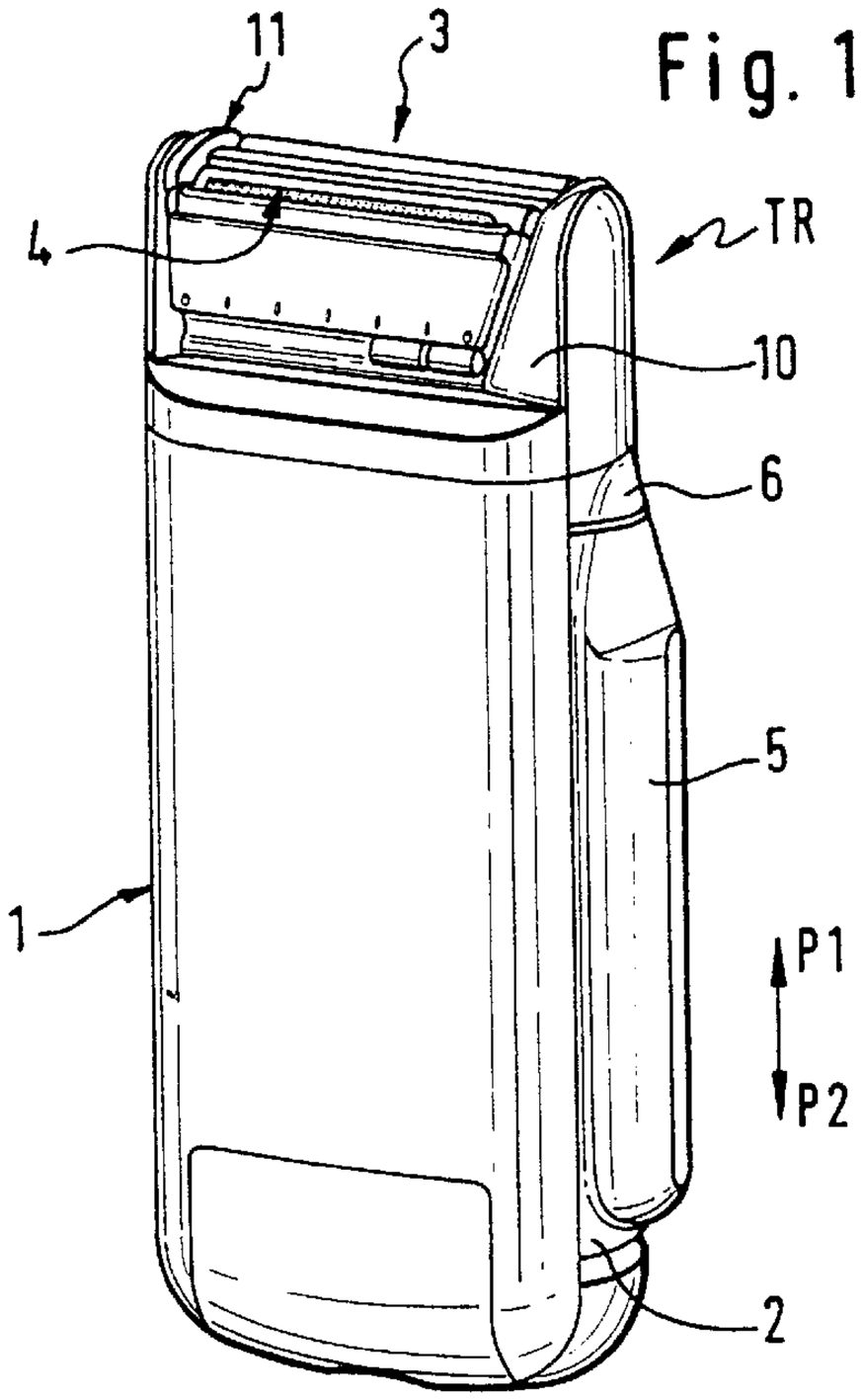


Fig. 1

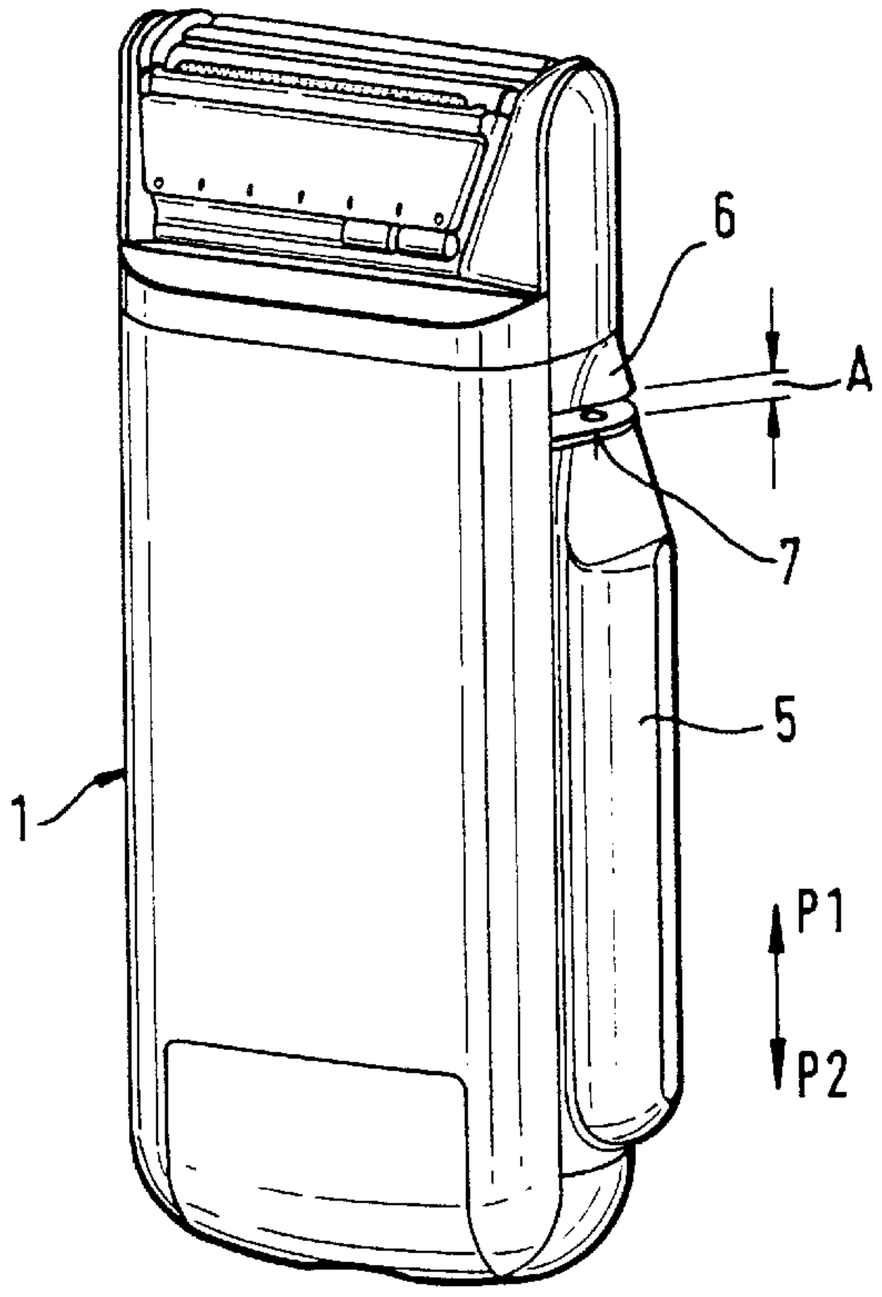


Fig. 2

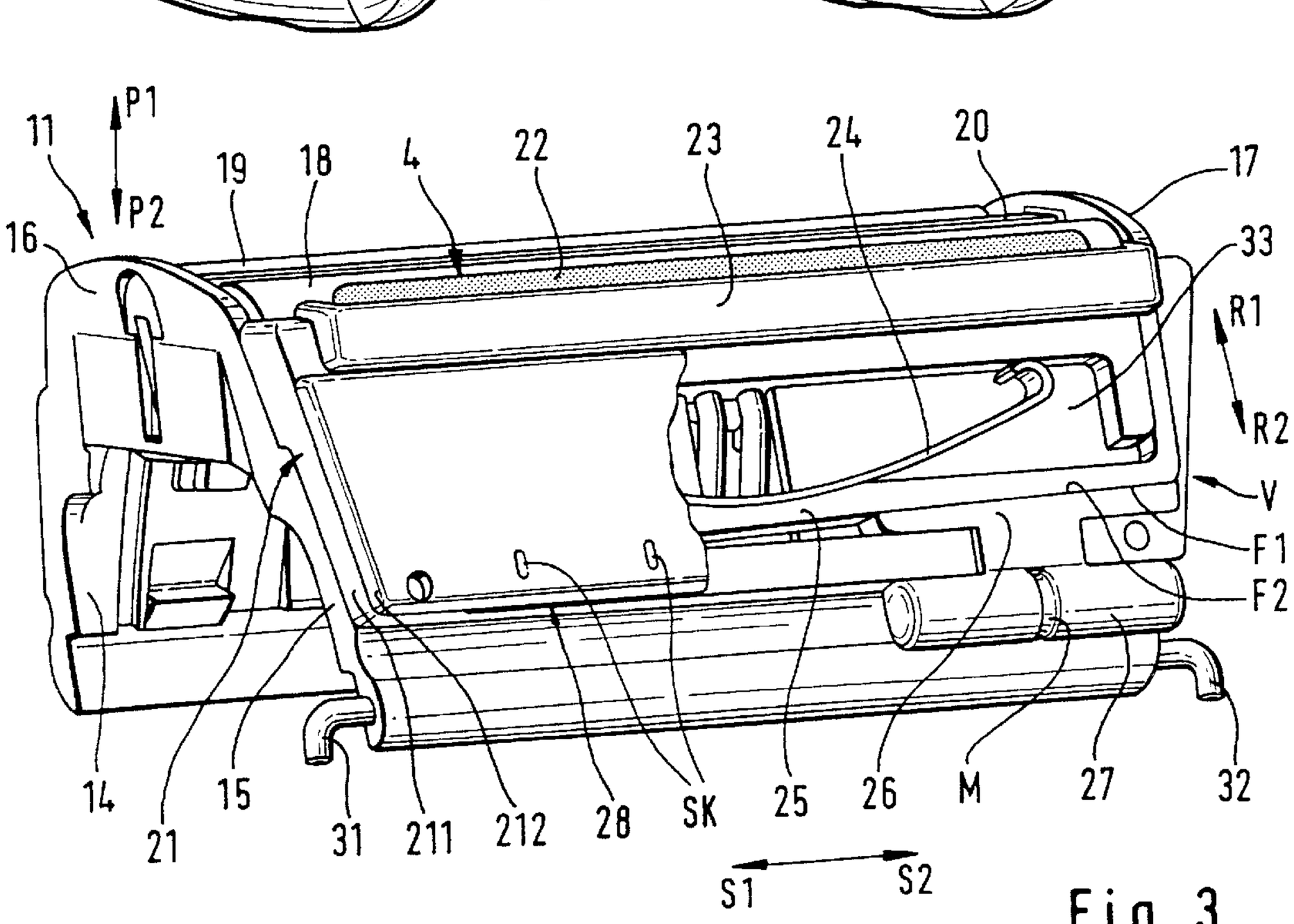
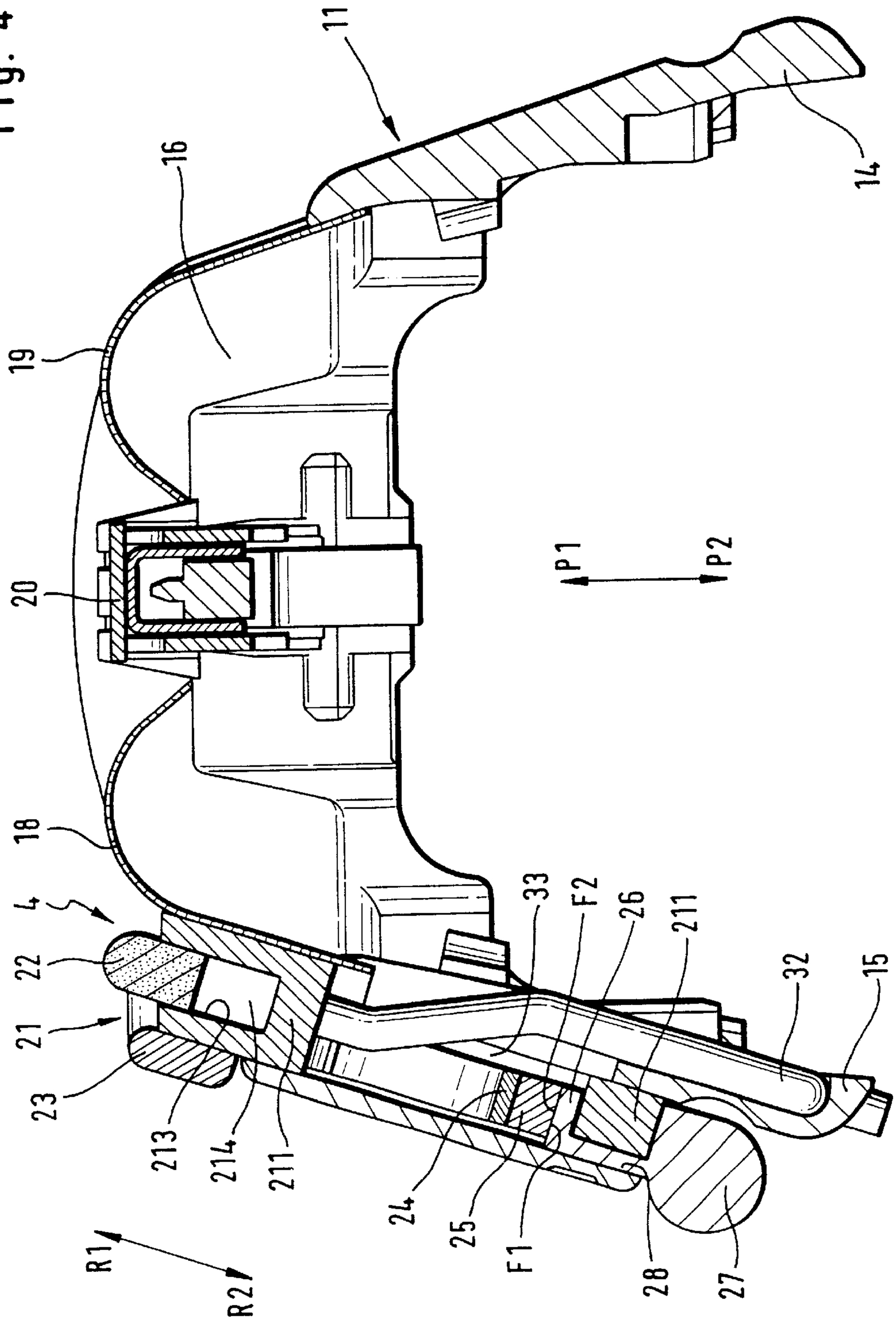


Fig. 3

Fig. 4


11
16
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18
4
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21
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213
214
211
24
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F1
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27
33
F2
26
211
32
15
P1
P2
R1
R2

Fig. 5

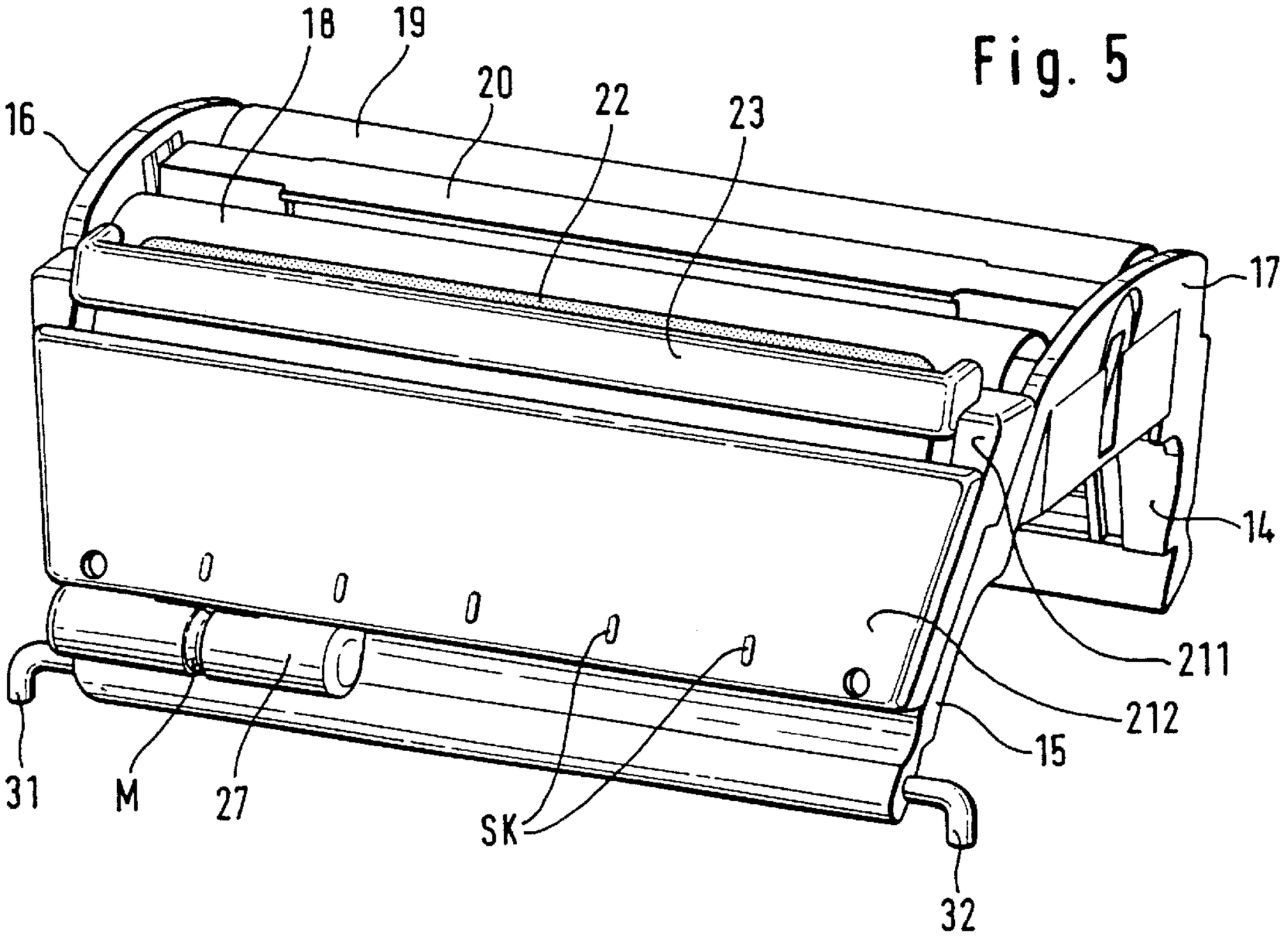
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Fig. 6

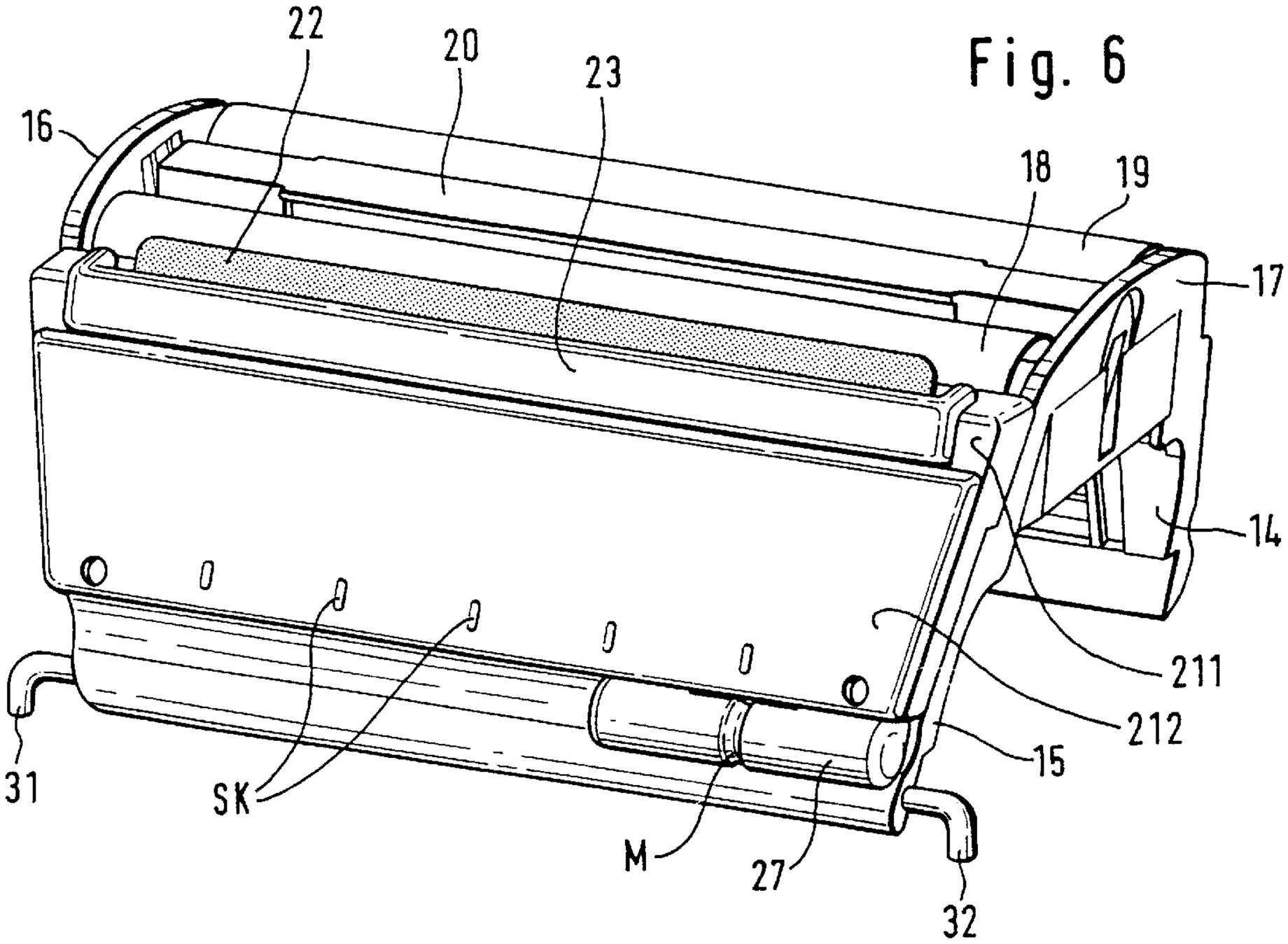
22
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Fig. 8

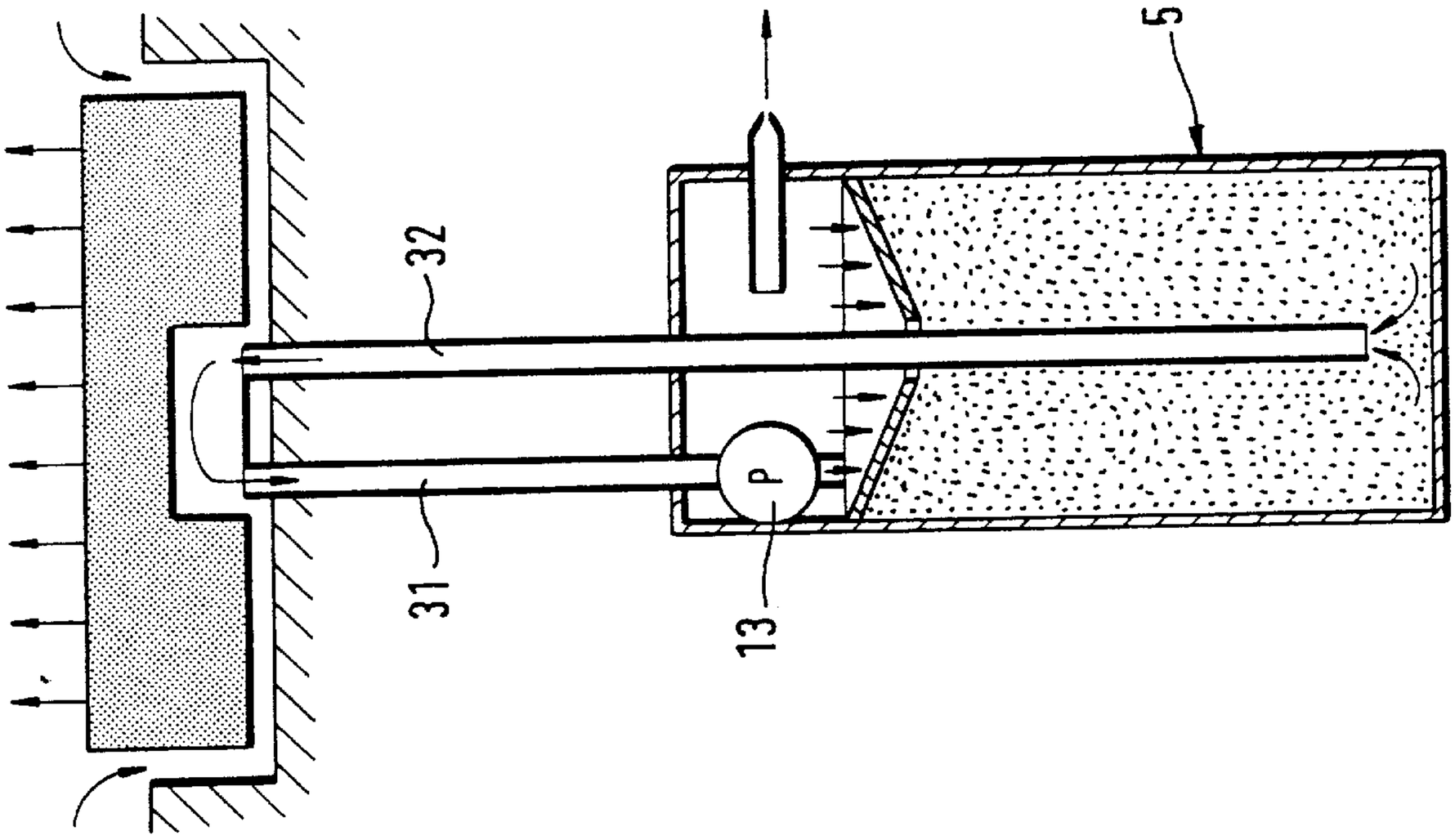


Fig. 7

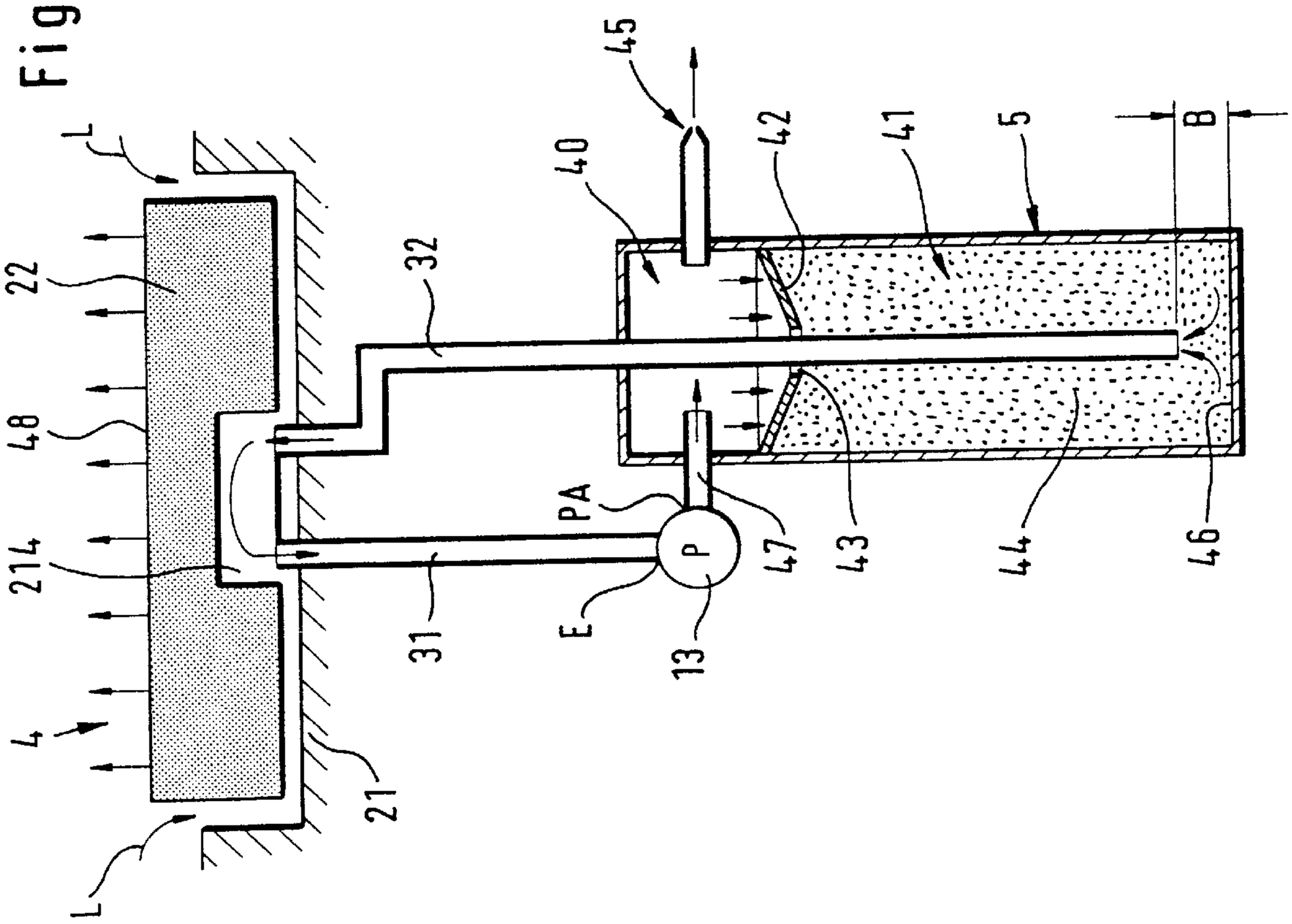


Fig. 9

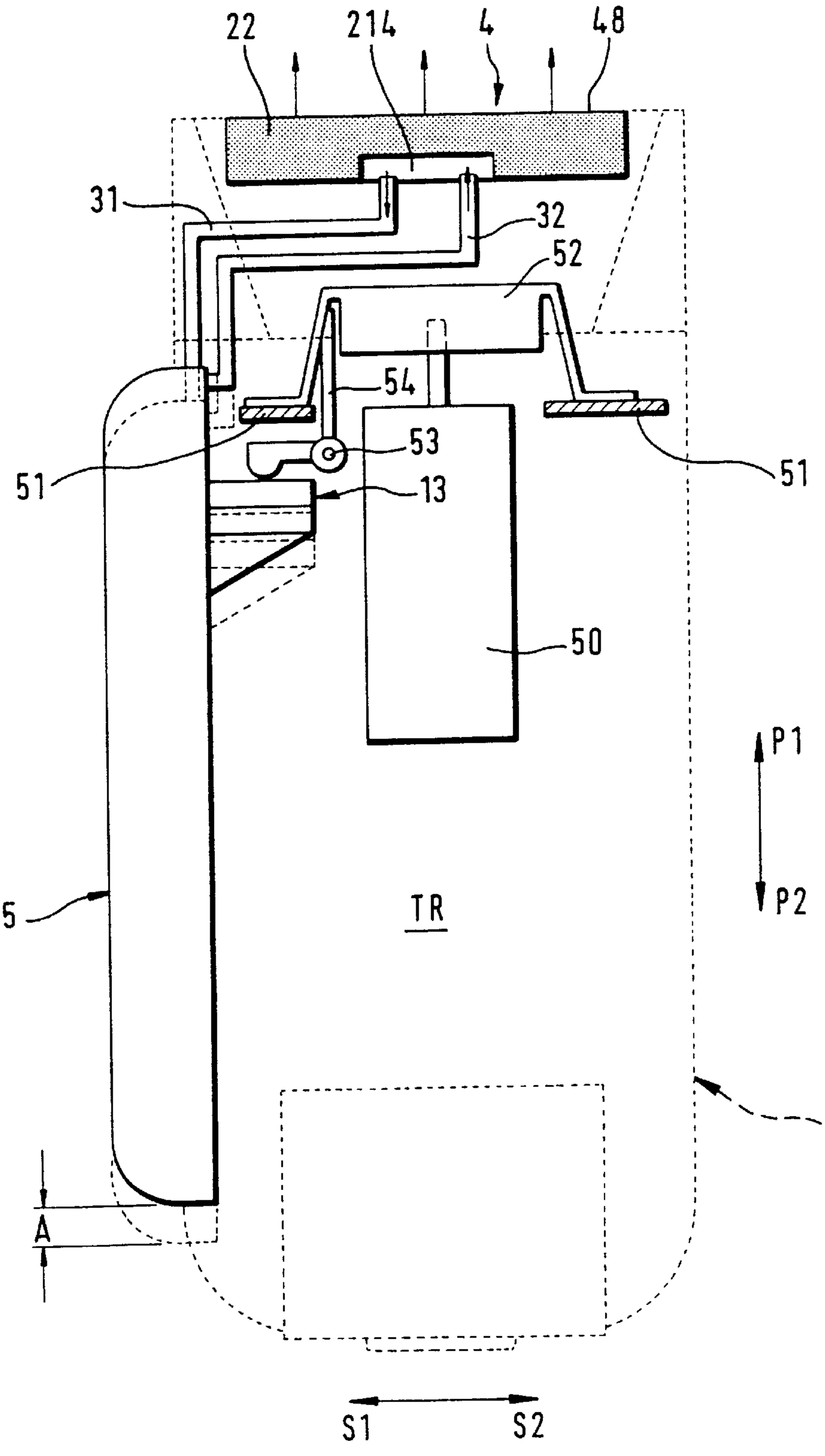


Fig. 10

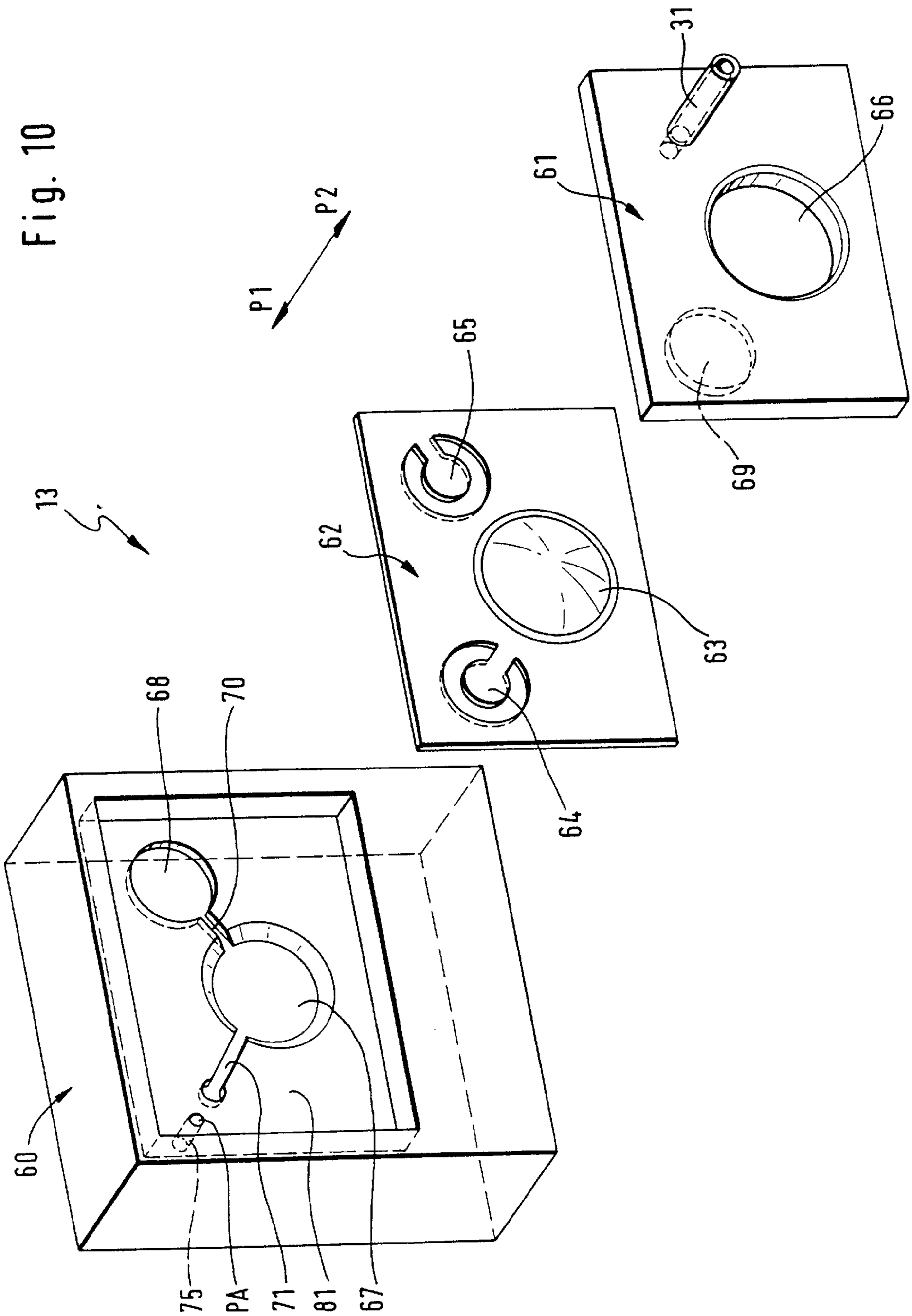
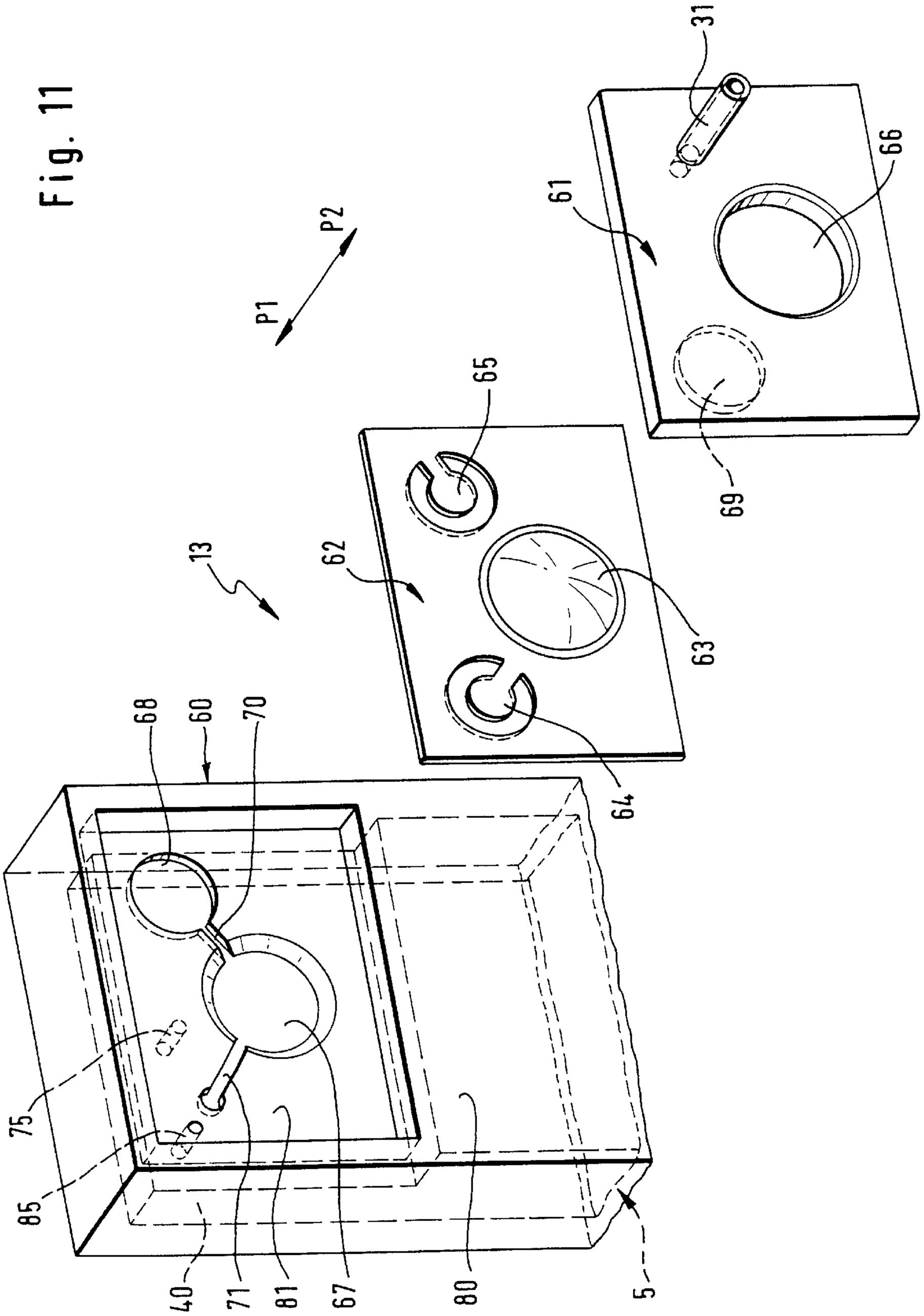


Fig. 11



PUMPING DEVICE

This is a continuation of PCT application Ser. No. PCT/EP99/08522, filed Nov. 6, 1999.

BACKGROUND

This invention relates to a pumping device for drawing in and delivering a liquid as, for example, a shaving aid, to a liquid dispensing device of a hair removing apparatus as, for example, a dry shaving apparatus, a hair clipping machine, or an epilation appliance, with a pump inlet, a pump outlet and a pumping element.

A pumping device for drawing in a lotion and dispensing it to the shaving head of a dry shaving apparatus is known from PCT WO 98/08661. The pump is comprised of a total of four components, including a housing part having a pump inlet and a pump outlet and integral flow channels, a membrane disk with nonreturn valves, a control disk, and a pumping element which is constructed from a membrane and designed to be actuated indirectly or directly by hand. It is an object of the present invention to simplify the pumping device of the type initially referred to, in particular to reduce the number of components. The pumping device should also be suitable for high pumping frequencies, i.e., for operation with an electric drive.

SUMMARY OF THE INVENTION

According to the invention this object is accomplished in a pumping device of the type initially referred to, wherein the pumping device is formed by a first and a second housing part having integrally formed therein flow channels as well as valve chambers and a membrane member disposed between the first and the second housing part and including a pumping element and at least one valve element, and that the pump inlet is adapted to be coupled to a liquid dispensing device and the pump outlet to a liquid container.

The pumping device of the invention has a plurality of advantages. One major advantage of the invention is that the pumping device is constructed from only three components. This results in a considerable saving of production costs.

According to one embodiment of the invention the pumping device is disposed outside a liquid container. According to a preferred embodiment of the invention the pumping device is disposed inside the liquid container.

A considerable saving of production costs results from one wall of a liquid container being constructed as a first housing part of the pumping device. The two other components, namely the membrane and the second housing part, are associated with this wall and secured to it. In a further aspect of the previously mentioned embodiment the membrane member arranged between the first housing part and the second housing part is of elastic construction.

A preferred embodiment of the invention is characterized in that the valve element and the pumping element are of elastic construction and provided as part of the membrane member. In a further aspect of the invention provision is made for the flow channel leading from a pump inlet to a pump outlet to be formed by a pump chamber and a first valve chamber and a second valve chamber.

An essential advantage of the invention results by designing the pumping device with the liquid container to be replaceable. Hence the efficiency of the pumping device is designed only for the quantity of liquid to be dispensed from the liquid container. The quality requirements to be imposed on the pumping device are therefore extremely low and

result accordingly in an extremely economical production of the pumping device and the liquid container.

One embodiment of the present invention is illustrated in the accompanying drawings and will be described in more detail in the following.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a dry shaving apparatus, showing the rear of the apparatus and a liquid container attached to one narrow side;

FIG. **2** is a view of the dry shaving apparatus of FIG. **1**, showing a liquid container spaced from a stop by a distance A;

FIG. **3** is a view of a cutter frame with a housing whose outer housing part is shown only in part to expose the interior of the housing;

FIG. **4** is a sectional view of the cutter frame **11** and the liquid dispensing device;

FIGS. **5** and **6** are perspective views of the cutter frame with a liquid dispensing device and an actuating element occupying different positions;

FIGS. **7** and **8** are schematic views of the liquid conveying arrangement comprised of a liquid container, a liquid dispensing device, a first and a second liquid conduit, and a pumping device;

FIG. **9** is schematic view of the outer contours of a dry shaving apparatus with a drive mechanism for operating a shaving arrangement and a pumping device for feeding liquid from a liquid container into the liquid dispensing device;

FIG. **10** is a view of a first and a second housing part and a membrane of a pumping device; and

FIG. **11** is a view illustrating the integration of a pumping device into the housing of a liquid container.

DETAILED DESCRIPTION

FIG. **1** shows a perspective representation of a dry shaving apparatus TR with a view of the rear of the housing **1** and of one of the two narrow sides **2** of the housing **1**, and of the shaving head **3** on which a liquid dispensing device **4** is provided. A liquid container **5** is adjustably arranged on the narrow side **2** of the housing **1**. In FIG. **1** the liquid container **5** is in abutment with a stop **6** provided on the housing **1**. This liquid container **5** may also be disposed inside the housing **1**—not illustrated.

FIG. **2** shows the dry shaving apparatus of FIG. **1**, the difference being that a distance A is produced between the upper wall **7** of the liquid container **5** and the stop **6** by sliding the liquid container **5** in the direction of the arrow P**2**. Sliding the liquid container **5** in the directions of the arrows P**1** or P**2** results in either the coupling or uncoupling of a pumping device **13** adapted to be driven by an electric drive **50** of the dry shaving apparatus—see FIG. **9**.

The shaving head **3** has at least one outer cutter and one undercutter cooperating therewith, as well as a shaving head frame **10** and a cutter frame **11** configured to be removed therefrom. One embodiment of such a cutter frame **11** is presented in FIGS. **3**, **4** and **5** and will be explained in more detail in the following.

Inside the cutter frame **11**—see also FIG. **4**, FIG. **5** and FIG. **6**—the outer cutters **18**, **19**, attached in arched form, of the short-hair cutter units are secured to longitudinally extending side walls **14** and **15** as well as to bars—not shown—disposed between end walls **16** and **17**. The long-

hair cutter unit with a U-shaped outer cutter **20** disposed between the two outer cutters **18** and **19** of the short-hair cutter units is mounted in the end walls **16** and **17** of the cutter frame **11** so that it can move in vertical direction—in the directions of the arrows P1 and P2.

A liquid dispensing device **4** is provided on one side wall **15** of the cutter frame **11**. The liquid dispensing device **4** is essentially comprised of a housing **21** made up of two housing parts **211** and **212**, an open-pore contact element **22** disposed in the housing **21**, a spacer **23** associated with the contact element **22**, and an adjusting device V by means of which the spacer **23** can be moved to and fro in the directions of the arrows R1 and R2. The adjusting device V is comprised of two cooperating adjusting elements **25** and **26** having surfaces F1 and F2 arranged at a relative inclination, a spring element **24**, and an actuating element **27**. Movably arranged in an inner compartment **33** of the housing part **211** of the housing **21** are the adjusting element **26** fitted with the actuating element **27**, and the adjusting element **25** provided on the spacer **23**. The spring element **24** rests with one part against a wall of the inner compartment of the housing part **211** and with another part against the adjusting element **25**, its predetermined spring pressure operating to maintain the incline surface F1 in abutment with the inclined surface F2 of the adjusting element **26**. The housing part **212** of the housing **21** is fastened to the housing part **211**, acting as a cover for the inner compartment **33** of the housing part **211**.

The actuating element **27** with a marking M is provided on the adjusting element **26**, which is slidably mounted inside the housing **21** and projects out of the housing **21** through an elongate opening **28**. The actuating element **27** with the marking M is slidable parallel to a scale SK provided on an outer wall of the housing part **212**. When the actuating element **27** is moved in the direction of the arrow S1, the inclined surface F2 of the adjusting element **26** cooperates with the inclined surface F1 of the adjusting element **25** to move the spacer **23** in the direction of the arrow R1. The spacer **23** is returned to its initial position —in the direction of the arrow R2—by sliding the actuating element **27** in the opposite direction—direction of the arrow S2.

The open-pore contact element **22**, which is equipped with a rinsing chamber **214**, is fixedly arranged in an inner compartment **213** of the housing part **211**. The housing part **211** is arranged adjacent and parallel to the longitudinal dimension of the outer cutter **18** in such a way that the contact element **22**, which is arranged in the inner compartment **213** and partly projects out of the inner compartment **213**, is in a position to dispense liquid to a zone adjacent to the outer cutter **18**. The contact surface of the contact element **22** used at any one time is variable and the liquid dispensing rate thus controllable by adjusting the spacer **23** relative to the contact element **22**—see FIGS. **5** and **6**.

The liquid to be dispensed by the contact element **22** of the liquid dispensing device is fed to the contact element **22** via a second liquid conduit **32**. Metered application of the liquid by the contact element **22** is also controllable by drawing liquid from the liquid dispensing device **4** via a first liquid conduit **31**.

FIG. **7** shows a schematic representation of an arrangement for conveying liquid from the liquid container **5** to the liquid dispensing device **4** and from the liquid dispensing device **4** back into the liquid container **5**. A partition wall **42** is provided in the liquid container **5** to form a first chamber **40** and a second chamber **41**. An opening is provided in the partition wall **42**. A second liquid conduit **32** is passed through this opening and terminates at a predetermined distance B from the bottom **46** of the liquid container **5**. The opening in the partition wall **42** is dimensioned so that a gap **43** is formed after the second liquid conduit **32** is passed through. This gap serves the function of feeding liquid from the first chamber **40** into the second chamber **41**. A porous storage material **44**—e.g., a sintered material—is provided in the second chamber **41** to store the liquid. The first chamber **40** is connected by a liquid conduit **47** to a pumping device **13** provided outside the liquid container **5**. The necessary pressure for conveying liquid from the second chamber **41** via the second liquid conduit **32**, which acts as a riser, to the liquid dispensing device **4** is obtainable by means of a pressure relief valve **45** when the liquid conveying arrangement is working. The pressure relief valve **45** may be comprised of a tube, for example, having an orifice whose cross section is dimensioned to enable the necessary atmospheric pressure for conveying the liquid to be reached after the pumping device **13** is started and to enable any excess pressure to be discharged.

A contact element **22** is fixedly arranged in the housing **21** of the liquid dispensing device **4**. By suitably shaping the contact element **22** a rinsing chamber **214** is provided in the contact element **22** which receives liquid via the second liquid conduit **32**. The liquid under pressure penetrates the open-pore material of the contact element **22** and, when the outer contact surface **48** is touched by the skin, is dispensed onto the skin as indicated by the arrows.

The rinsing chamber **214** is coupled by a first liquid conduit **31** to the inlet side E of the pumping device **13**. The outlet side PA of the pumping device **13** is coupled by a liquid conduit **47** to the first chamber **40** of the liquid container **5**. When the pumping device **13** is set in operation it draws in air via the housing **21**—see the arrow L—as well as liquid from the rinsing chamber **214** and/or the contact element **22**, feeding it to the first chamber **40** to build up there the necessary pressure for conveying liquid from the second chamber **41** via the second liquid conduit **32** to the rinsing chamber **214**. By returning any surplus liquid from the rinsing chamber **214** and/or the contact element, which results from the suction cycle of the pumping device **13**, it is possible to control the dispensing of liquid by the contact element **22** in such a way that liquid is dispensed to a skin to be wetted only when the contact surface of the contact element **22** is touched. Hence no liquid is dispensed when the contact element **22** is not being touched.

The gap **43** between the partition wall **42** and the second liquid conduit **32**, which acts as a riser, is dimensioned so that the liquid delivered by the pumping device **13** into the first chamber **40** can penetrate the storage material **44** in the second chamber **41**. Any reverse flow of liquid stored in the storage material from the second chamber **41** through the gap **43** into the first chamber **40** is prevented by the bonding effect of the liquid to the storage material **44**.

FIG. **8** shows the liquid conveying arrangement of FIG. **7**, the difference being that the pumping device **13** is disposed inside the liquid container **5**, i.e., in the first chamber **40**. The pumping device is part of the liquid container **5** and can be replaced together with it. The liquid container **5** can be replaced because the first liquid conduit **31** and the second liquid conduit **32** are coupled to the liquid container **5** by means of suitable coupling elements—not shown. Such coupling elements can also be provided in the first liquid conduit **31** and the second liquid conduit **32** of FIG. **7** in order to couple the pumping device **13** and the liquid container **5** to said conduits.

A suitably shaped rubber part, which tightly closes the complete unit, including the first and second liquid conduits

31, 32, is used as a cover for the liquid container 5. Metal tips of the first and second liquid conduits 31, 32, which are located inside the housing 1, pierce the cover in the area of the conduits when the cleaning liquid container is inserted, thus opening the liquid circuit.

The described configuration of the liquid container 5 is preferably implementable as a disposable cartridge or in the form of a container which can be filled in or on the hair removing apparatus.

FIG. 9 shows a schematic representation of the layout of a liquid conveying arrangement of FIG. 7 in a dry shaving apparatus TR of FIGS. 1 and 2. The contours of the dry shaving apparatus are represented by dotted lines by way of example.

In the housing 1 of the dry shaving apparatus TR there is arranged an electric motor 50 whose motor shaft is coupled by an eccentric to an oscillating member 52 in order to make it oscillate to and fro—see the directions of the arrows S1 and S2. The oscillating bridge 52 serves the function of driving cutter elements of the dry shaving apparatus TR—not illustrated—in addition to driving the pumping device 13 of the liquid dispensing device 4. For this purpose the oscillating member 52—which is fastened, for example, on wall elements 51 of the housing 1 of the dry shaving apparatus TR—is coupled by way of a double-armed oscillating lever 54, which is pivotally connected to a pivot 53 provided on the housing 1, to a pumping element of the pumping device 13 in order to transmit a driving motion. This driving connection is interruptible by sliding the liquid container 5 in the direction of the arrow P2 by a distance A so that no liquid is fed from the container 5 into the rinsing chamber 214 and the open-pore contact element 22. By sliding the liquid container 5 in the direction of the arrow P1 it is possible to re-establish the connection between the pumping element of the pumping device 13 and the double-armed lever 54 so that when the electric motor 50 is set in operation the oscillating movements of the oscillating member 52 are transmitted via the double-armed lever 54 to the pumping element of the pumping device 13, thus re-starting the liquid conveying arrangement.

The rinsing chamber 214 is coupled to the liquid container 5 via the pumping device 13 by means of a first liquid conduit 31—see FIG. 9—and to the first chamber 40 by means of a second liquid conduit 32. The first and second liquid conduits are of flexible construction in order to be able to follow the sliding movement of the liquid container 5 in the directions of the arrows P1 and P2.

The components of a pumping device 13 are shown in FIG. 10. The pumping device 13 is comprised of only three parts, including a first housing part 60, a second housing part 61, and a membrane 62 which is disposed between the first housing part 60 and the second housing part 61. The membrane 62 has an elastic pumping element 63 projecting from the planar membrane wall in slightly domed form. Two flutter valves 64 and 65, which act as non-return valves, are provided in the wall of the membrane 62. The flutter valves 64 and 65 are elastically formed in the membrane wall and are a part of the membrane 62. The second housing part 61 is equipped with an opening 66 through which the pumping element 63 can be actuated by a drive element, e.g., by one arm of the double-armed lever 54 of FIG. 9. A first liquid conduit 31 is connectable to the second housing part 61. In the first housing part 60 is a pump chamber 67 which is connectable by way of a flow channel 70 to a first valve chamber 68 and by way of a further flow channel 71 to the second valve chamber 69 provided in the second housing part 61. The second valve chamber 69 is adapted to be coupled by way of an outlet PA and a pump outlet conduit 75 to a liquid conduit 47 leading to the first chamber 40 of the liquid container 5—see FIG. 7. The flutter valve 65 provided in the membrane 62 is associated on the one hand with the first liquid conduit 31 and on the other hand with the first valve chamber 68. The flutter valve 64 is associated with the second valve chamber 69 and with the liquid conduit 47 leading out of said chamber. Exerting a reciprocating pumping movement on the pumping element 63 causes the pumping element 63 to draw in and pump out liquid and/or air in alternation. During the pumping cycle the pumping element 63 is urged into the pump chamber 67 in the direction of the arrow P1. As this occurs, the liquid and/or air present in the pump chamber 67 is urged via the flow channel 71 against the flutter valve 64, moving the elastic flutter valve 64 into the second valve chamber 69, thereby clearing the flow path for the liquid and/or air via the second valve chamber 69 into the pump outlet conduit 75. The liquid and/or air subsequently flows via a connectable liquid conduit 47 into the first chamber 40 of the liquid container. During this pumping cycle the air and/or liquid exposed to the pumping pressure acts via the flow channel 70 and the first valve chamber 68 against the flutter valve 65, closing the pump inlet opening in the second housing part 61 which is adapted to be coupled with the first liquid conduit 31.

On termination of the pumping cycle the tensioned elastic pumping element 63 moves in the direction of the arrow P2 back to its initial position, thereby drawing in air and/or liquid from the first liquid conduit 31. This suction cycle causes the flutter valve 65 to move into the first valve chamber 68, thus clearing the liquid conduit 31 and enabling the air and/or liquid to flow via the first valve chamber and the flow channel 70 into the pump chamber 67. The flutter valve 64 is constructed and arranged relative to the flow channel 71 so that during the suction cycle the flow channel 70 is covered to such an extent that no air and/or liquid is allowed to flow past the flutter valve 64 into the second valve chamber 69 nor from there into the opening, not covered by the flutter valve 64, of the outlet PA and the pump outlet conduit 75.

The pumping device 13 represented in FIG. 10 may be arranged either outside or inside a liquid container 5, as is shown in FIGS. 7 and 8.

According to a further embodiment the pumping device 13 may also be configured as part of the liquid container 5, as is shown in FIG. 11 by way of example.

The pumping device of FIG. 11 differs from the pumping device of FIG. 10 only inasmuch as the first housing part 60 of the pumping device 13 is part of a wall of the liquid container 5. In FIG. 11 part of the interior of a liquid container 5, namely the first chamber 40, is represented by broken lines. The chamber 40 is connectable by way of a pump outlet conduit 75 to the second liquid conduit—see FIG. 7. In the front 80 of the liquid container 5 provision is made for a depression 81 accommodating the first valve chamber 68, the flow channel 70, the pump chamber 67, the flow channel 71, and a liquid conduit 85 connecting the second valve chamber 69 to the first chamber 40 of the liquid container 5. The membrane 62 is embedded in the depression 81 and, using the second housing part 61 and suitable fastening elements, the previously listed components are assembled to form a complete pumping device 13 and then put into operation.

The liquid container 5 is inserted in the housing 1 of the hair removing apparatus and the sealing part pierced in the

areas of the conduits, thus establishing a connection to the liquid conveying arrangement of the apparatus **1**. Inserting the liquid container **5** simultaneously positions the pumping device **13** in front of the oscillating member **54** located in the housing **1**. When the application function is activated the pumping device **13** begins to build up pressure in the liquid container **5**. The air drawn in during the starting cycle is pumped into the first chamber **40** and can pass through the outlet gap **43** between the second liquid conduit **32** and the partition wall **42** into the second chamber **41** where it exerts pressure on the liquid. At the same time the suction cycle of the pumping device **13** produces a suction effect in the second liquid conduit **32** of the liquid circuit, which draws the liquid into the liquid dispensing device **4**. The application point in the liquid dispensing device **4** is designed so that the pumping device **13** can draw in air from the outside at the same time as drawing in the non-applied liquid. Hence after the starting cycle the pumping device **13** invariably feeds a mixture of liquid and air into the liquid container **5**, where the mixture is separated into its two components. This separation occurs on the inner wall of the first chamber **40** as the result of the adhesive force of the droplets. As the drops grow bigger they flow back through the outlet gap **43** into the second chamber **41** and so are returned to the liquid circuit.

Because this arrangement permanently draws in air in addition to the non-consumed liquid, the pressure built up in the first chamber **40** is higher than that which escapes with the liquid. This overpressure in the first chamber **40** prevents the liquid flowing back from the second chamber **41** into the first chamber **40**. The pressure is stabilized by a defined opening in the air discharge throttle which acts as a pressure relief valve. Arranging the air discharge throttle in the upper area of the first partitioned chamber **40** prevents the inflowing droplets being blown out unintentionally when the hair removing apparatus is in an inclined position. Operation of the arrangement is thus guaranteed even with the hair removing apparatus turned through 180° compared to the position illustrated in FIG. **1**.

The porous storage material ensures operational reliability also in cases when the liquid container **5** is not full. In this case the liquid reaches the suction zone of the second liquid conduit **32** through the capillary action of the storage material. Liquid movements and attendant noise are also minimized.

On account of the described structural design it is possible to store and dispense liquids independently of position and movement, with the arrangement simultaneously providing for regulation of the quantity of liquid to be dispensed.

What is claimed is:

1. A pumping device for drawing in and delivering a liquid to a liquid dispensing device of a hair removing apparatus the pumping device comprising a pump inlet, a pump outlet, and a pumping element, wherein said pumping device is formed by a first and a second housing part each having a valve chamber, the second housing part having integrally formed therein a first and a second flow channel, the pumping device having a membrane member disposed between the first and the second housing part, the membrane member including a pumping element and at least one valve element, and wherein the pump inlet is adapted to be coupled to the liquid dispensing device and the pump outlet to a liquid container.

2. The pumping device of claim **1**, wherein the pumping device is provided outside the liquid container.

3. The pumping device of claim **1**, wherein the pumping device is provided inside the liquid container.

4. The pumping device of claim **1**, wherein one wall of the liquid container is constructed as the first housing part of the pumping device.

5. The pumping device of claim **1**, wherein the membrane member is of elastic construction.

6. The pumping device of claim **1**, wherein the valve element and the pumping element are of elastic construction and provided as part of the membrane member.

7. The pumping device of claim **1**, wherein a flow path leading from the pump inlet to the pump outlet is formed by a pump chamber and the valve chamber of the first housing part as well as the valve chamber of the second housing part.

8. The pumping device of claim **1**, wherein the pumping device with the liquid container is arranged to be replaceable.

9. The pumping device of claim **1**, wherein the pumping device is designed to draw in and deliver at least one of a gaseous and a liquid medium and to build up a delivery pressure for the liquid held in the liquid container.

10. A hair removing apparatus comprising:

a housing;

a liquid dispenser connected to the housing; and

a pumping device for delivering a liquid to the liquid dispenser, the pumping device comprising a first housing part, and a membrane between the first housing part and a second housing part, the membrane including a valve and a flexible diaphragm, at least one of the first and second housing parts defining an aperture exposing the flexible diaphragm;

wherein the pumping device is coupled to a liquid container arranged in or on the housing.

11. The hair removing apparatus of claim **10**, wherein the aperture provides a drive element access to the flexible diaphragm for actuation of the flexible diaphragm.

12. The hair removing apparatus of claim **10**, wherein the first and second housing parts each include a valve chamber.

13. The hair removing apparatus of claim **10** further including a pump inlet connected to the liquid dispenser.

14. The hair removing apparatus of claim **10** further including a pump outlet connected to the liquid container.

15. The hair removing apparatus of claim **10**, wherein the pumping device is provided outside the liquid container.

16. The hair removing apparatus of claim **10**, wherein the pumping device is provided inside the liquid container.

17. The hair removing apparatus of claim **10**, wherein one wall of the liquid container is constructed as the first housing part of the pumping device.

18. The hair removing apparatus of claim **10**, wherein the pumping device with the liquid container is arranged to be replaceable.

19. The hair removing apparatus of claim **10**, wherein the pumping device is designed to draw in and deliver at least one of a gaseous and a liquid medium and to build up a delivery pressure for the liquid held in the liquid container.

20. The hair removing apparatus of claim **10**, wherein at least one of the first and second housing parts include first and second flow channels.

21. The pumping device of claim **10**, wherein the membrane is of elastic construction.

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